RAW SEQUENCE LISTING
PATENT APPLICATION: US/09/903,323A

DATE: 03/18/2002
TIME: 15:36:32

Input Set : A:\510015-261.TXT
Output Set: N:\CRF3\03182002\I903323A.raw

<110> APPLICANT: De Robertis, Edward M.
Bouwmeester, Tewis
<120> TITLE OF INVENTION: Endoderm, Cardiac and Neural Inducing Factors
<130> FILE REFERENCE: 510015-261
<140> CURRENT APPLICATION NUMBER: US 09/903,323A
<141> CURRENT FILING DATE: 2001-07-11
<150> PRIOR APPLICATION NUMBER: US 60/020,150
<151> PRIOR FILING DATE: 1996-06-20
<160> NUMBER OF SEQ ID NOS: 10
<170> SOFTWARE: FastSEQ for Windows Version 3.0
<210> SEQ ID NO: 1
<211> LENGTH: 270
<212> TYPE: PRT
<213> ORGANISM: Xenopus
<400> SEQUENCE: 1

```
Met Leu Leu Asn Val Leu Arg Ile Cys Ile Ile Val Cys Leu Val Asn
 1               5                  10                  15
Asp Gly Ala Gly Lys His Ser Glu Gly Arg Glu Arg Thr Lys Thr Tyr
            20                  25                  30
Ser Leu Asn Ser Arg Gly Tyr Phe Arg Lys Glu Arg Gly Ala Arg Arg
        35                  40                  45
Ser Lys Ile Leu Leu Val Asn Thr Lys Gly Leu Asp Glu Pro His Ile
    50                  55                  60
Gly His Gly Asp Phe Gly Leu Val Ala Glu Leu Phe Asp Ser Thr Arg
65                  70                  75                  80
Thr His Thr Asn Arg Lys Glu Pro Asp Met Asn Lys Val Lys Leu Phe
                85                  90                  95
Ser Thr Val Ala His Gly Asn Lys Ser Ala Arg Arg Lys Ala Tyr Asn
            100                 105                 110
Gly Ser Arg Arg Asn Ile Phe Ser Arg Arg Ser Phe Asp Lys Arg Asn
        115                 120                 125
Thr Glu Val Thr Glu Lys Pro Gly Ala Lys Met Phe Trp Asn Asn Phe
    130                 135                 140
Leu Val Lys Met Asn Gly Ala Pro Gln Asn Thr Ser His Gly Ser Lys
145                 150                 155                 160
Ala Gln Glu Ile Met Lys Glu Ala Cys Lys Thr Leu Pro Phe Thr Gln
                165                 170                 175
Asn Ile Val His Glu Asn Cys Asp Arg Met Val Ile Gln Asn Asn Leu
            180                 185                 190
Cys Phe Gly Lys Cys Ile Ser Leu His Val Pro Asn Gln Gln Asp Arg
        195                 200                 205
Arg Asn Thr Cys Ser His Cys Leu Pro Ser Lys Phe Thr Leu Asn His
```

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```
      210                 215                 220
Leu Thr Leu Asn Cys Thr Gly Ser Lys Asn Val Val Lys Val Val Met
225                 230                 235                 240
Met Val Glu Glu Cys Thr Cys Glu Ala His Lys Ser Asn Phe His Gln
                245                 250                 255
Thr Ala Gln Phe Asn Met Asp Thr Ser Thr Thr Leu His His
            260                 265                 270
```

<210> SEQ ID NO: 2
<211> LENGTH: 1338
<212> TYPE: DNA
<213> ORGANISM: Xenopus

<400> SEQUENCE: 2

```
gaattcccag caagtcgctc agaaacactg cagggtctag atatcataca atgttactaa      60
atgtactcag gatctgtatt atcgtctgcc ttgtgaatga tggagcagga aaacactcag     120
aaggacgaga aaggacaaaa acatattcac ttaacagcag aggttacttc agaaaagaaa     180
gaggagcacg taggagcaag attctgctgg tgaatactaa aggtcttgat gaaccccaca     240
ttgggcatgg tgattttcgc ttagtagctg aactatttga ttccaccaga acacatacaa     300
acagaaaaga gccagacatg aacaaagtca agcttttctc aacagttgcc catggaaaca     360
aaagtgcaag aagaaaagct tacaatggtt ctagaaggaa tatttttcct cgccgttctt     420
ttgataaaag aaatacagag gttactgaaa agcctggtgc caagatgttc tggaacaatt     480
ttttggttaa aatgaatgga gccccacaga atacaagcca tggcagtaaa gcacaggaaa     540
taatgaaaga agcttgcaaa accttgtttt tcactcagaa tattgtacat gaaaactgtg     600
acaggatggt gatacagaac aatctgtgct ttggtaaatg catctctctc catgttccaa     660
atcagcaaga tcgacgaaat acttgttccc attgcttgcc gtccaaattt accctgaacc     720
acctgacgct gaattgtact ggatctaaga atgtagtaaa ggttgtcatg atggtagagg     780
aatgcacgtg tgaagctcat aagagcaact tccaccaaac tgcacagttt aacatggata     840
catctactac cctgcaccat taaaggactg ccatacagta tggaaatgcc cttttgttgg     900
aatatttgtt acatactatg catctaaagc attatgttgc cttctatttc atataaccac     960
atggaataag gattgtatga attataatta acaaatggca ttttgtgtaa catgcaagat    1020
ctctgttcca tcagttgcaa gataaaaggc aatatttgtt tgacttttt tctacaaaat    1080
gaatacccaa atatatgata agataatggg gtcaaaactg ttaaggggta atgtaataat    1140
agggactaag tttgcccagg agcagtgacc cataacaacc aatcagcagg tatgatttac    1200
tggtcacctg tttaaaagca aacatcttat tggttgctat gggttactgc ttctgggcaa    1260
aatgtgtgcc tcataggggg gttagtgtgt tgtgtactga ataaattgta tttatttcat    1320
tgttacaaaa aaaaaaaa                                                  1338
```

<210> SEQ ID NO: 3
<211> LENGTH: 318
<212> TYPE: PRT
<213> ORGANISM: Xenopus frazzled

<400> SEQUENCE: 3

```
Met Ser Arg Thr Arg Lys Val Asp Ser Leu Leu Leu Leu Ala Ile Pro
 1               5                  10                  15
Gly Leu Ala Leu Leu Leu Leu Pro Asn Ala Tyr Cys Ala Ser Cys Glu
            20                  25                  30
Pro Val Arg Ile Pro Met Cys Lys Ser Met Pro Trp Asn Met Thr Lys
        35                  40                  45
Met Pro Asn His Leu His His Ser Thr Gln Ala Asn Ala Ile Leu Ala
    50                  55                  60
Ile Glu Gln Phe Glu Gly Leu Leu Thr Thr Glu Cys Ser Gln Asp Leu
```

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Input Set : A:\510015-261.TXT
Output Set: N:\CRF3\03182002\I903323A.raw

```
109  65                  70                  75                  80
110  Leu Phe Phe Leu Cys Ala Met Tyr Ala Pro Ile Cys Thr Ile Asp Phe
111                  85                  90                  95
112  Gln His Glu Pro Ile Lys Pro Cys Lys Ser Val Cys Glu Arg Ala Arg
113              100                 105                 110
114  Ala Gly Cys Glu Pro Ile Leu Ile Lys Tyr Arg His Thr Trp Pro Glu
115          115                 120                 125
116  Ser Leu Ala Cys Glu Glu Leu Pro Val Tyr Asp Arg Gly Val Cys Ile
117      130                 135                 140
118  Ser Pro Glu Ala Ile Val Thr Val Glu Gln Gly Thr Asp Ser Met Pro
119  145                 150                 155                 160
120  Asp Phe Ser Met Asp Ser Asn Asn Gly Asn Cys Gly Ser Gly Arg Glu
121                  165                 170                 175
122  His Cys Lys Cys Lys Pro Met Lys Ala Thr Gln Lys Thr Tyr Leu Lys
123              180                 185                 190
124  Asn Asn Tyr Asn Tyr Val Ile Arg Ala Lys Val Lys Glu Val Lys Val
125          195                 200                 205
126  Lys Cys His Asp Ala Thr Ala Ile Val Glu Val Lys Glu Ile Leu Lys
127      210                 215                 220
128  Ser Ser Leu Val Asn Ile Pro Lys Asp Thr Val Thr Leu Tyr Thr Asn
129  225                 230                 235                 240
130  Ser Gly Cys Leu Cys Pro Gln Leu Val Ala Asn Glu Glu Tyr Ile Ile
131                  245                 250                 255
132  Met Gly Tyr Glu Asp Lys Glu Arg Thr Arg Leu Leu Leu Val Glu Gly
133              260                 265                 270
134  Ser Leu Ala Glu Lys Trp Arg Asp Arg Leu Ala Lys Lys Val Lys Arg
135          275                 280                 285
136  Trp Asp Gln Lys Leu Arg Arg Pro Arg Lys Ser Lys Asp Pro Val Ala
137      290                 295                 300
138  Pro Ile Pro Asn Lys Asn Ser Asn Ser Arg Gln Ala Arg Ser
139  305                 310                 315
141 <210> SEQ ID NO: 4
142 <211> LENGTH: 1875
143 <212> TYPE: DNA
144 <213> ORGANISM: Xenopus frazzled
146 <400> SEQUENCE: 4
147  gaattccctt tcacacagga ctcctggcag aggtgaatgg ttagccctat ggatttggtt     60
148  tgttgatttt gacacatgat tgattgcttt cagataggat tgaaggactt ggatttttat    120
149  ctaattctgc acttttaaat tatctgagta attgttcatt ttgtattgga tgggactaaa    180
150  gataaactta actccttgct tttgacttgc ccataaacta taaggtgggg tgagttgtag    240
151  ttgcttttac atgtgcccag attttccctg tattccctgt attccctcta aagtaagcct    300
152  acacatacag gttgggcaga ataacaatgt ctcgaacaag gaaagtggac tcattactgc    360
153  tactggccat acctggactg gcgcttctct tattacccaa tgcttactgt gcttcgtgtg    420
154  agcctgtgcg gatccccatg tgcaaatcta tgccatggaa catgaccaag atgcccaacc    480
155  atctccacca cagcactcaa gccaatgcca tcctggcaat tgaacagttt gaaggtttgc    540
156  tgaccactga atgtagccag gacctttgt tctttctgtg tgccatgtat gcccccattt    600
157  gtaccatcga tttccagcat gaaccaatta agccttgcaa gtccgtgtgc gaaagggcca    660
158  gggccggctg tgagcccatt ctcataaagt accggcacac ttggccagag agcctggcat    720
159  gtgaagagct gcccgtatat gacagaggag tctgcatctc cccagaggct atcgtcacag    780
```

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Input Set : A:\510015-261.TXT
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```
160  tggaacaagg aacagattca atgccagact tctccatgga ttcaaacaat ggaaattgcg     840
161  gaagcggcag ggagcactgt aaatgcaagc ccatgaaggc aacccaaaag acgtatctca     900
162  agaataatta caattatgta atcagagcaa aagtgaaaga ggtgaaagtg aaatgccacg     960
163  acgcaacagc aattgtggaa gtaaaggaga ttctcaagtc ttccctagtg aacattccta    1020
164  aagacacagt gacactgtac accaactcag gctgcttgtg cccccagctt gttgccaatg    1080
165  aggaatacat aattatgggc tatgaagaca aagagcgtac caggcttcta ctagtggaag    1140
166  gatccttggc cgaaaaatgg agagatcgtc ttgctaagaa agtcaagcgc tgggatcaaa    1200
167  agcttcgacg tcccaggaaa agcaaagacc ccgtggctcc aattcccaac aaaaacagca    1260
168  attccagaca agcgcgtagt tagactaacg gaaaggtgta tggaaactct atggactttg    1320
169  aaactaagat ttgcattgtt ggaagagcaa aaaagaaatt gcactacagc acgttatatt    1380
170  ctattgttta ctacaagaag ctggtttagt tgattgtagt tctcctttcc ttctttttt     1440
171  ttataactat atttgcacgt gttcccaggc aattgtttta ttcaacttcc agtgacagag    1500
172  cagtgactga atgtctcagc ctaaagaagc tcaattcatt tctgatcaac taatggtgac    1560
173  aagtgtttga tacttgggga aagtgaacta attgcaatgg taaatcagag aaaagttgac    1620
174  caatgttgct tttcctgtag atgaacaagt gagagatcac atttaaatga tgatcacttt    1680
175  ccatttaata ctttcagcag ttttagttag atgacatgta ggatgcacct aaatctaaat    1740
176  attttatcat aaatgaagag ctggtttaga ctgtatggtc actgttggga aggtaaatgc    1800
177  ctactttgtc aattctgttt taaaaattgc ctaaataaat attaagtcct aaataaaaaa    1860
178  aaaaaaaaaa aaaaa                                                    1875
180 <210> SEQ ID NO: 5
181 <211> LENGTH: 896
182 <212> TYPE: PRT
183 <213> ORGANISM: Xenopus
185 <400> SEQUENCE: 5
186  Met Leu Leu Leu Phe Arg Ala Ile Pro Met Leu Leu Leu Gly Leu Met
187   1               5                  10                  15
188  Val Leu Gln Thr Asp Cys Glu Ile Ala Gln Tyr Tyr Ile Asp Glu Glu
189              20                  25                  30
190  Glu Pro Pro Gly Thr Val Ile Ala Val Leu Ser Gln His Ser Ile Phe
191          35                  40                  45
192  Asn Thr Thr Asp Ile Pro Ala Thr Asn Phe Arg Leu Met Lys Gln Phe
193      50                  55                  60
194  Asn Asn Ser Leu Ile Gly Val Arg Glu Ser Asp Gly Gln Leu Ser Ile
195  65                  70                  75                  80
196  Met Glu Arg Ile Asp Arg Glu Gln Ile Cys Arg Gln Ser Leu His Cys
197                  85                  90                  95
198  Asn Leu Ala Leu Asp Val Val Ser Phe Ser Lys Gly His Phe Lys Leu
199              100                 105                 110
200  Leu Asn Val Lys Val Glu Val Arg Asp Ile Asn Asp His Ser Pro His
201          115                 120                 125
202  Phe Pro Ser Glu Ile Met His Val Glu Val Ser Glu Ser Ser Ser Val
203      130                 135                 140
204  Gly Thr Arg Ile Pro Leu Glu Ile Ala Ile Asp Glu Asp Val Gly Ser
205  145                 150                 155                 160
206  Asn Ser Ile Gln Asn Phe Gln Ile Ser Asn Asn Ser His Phe Ser Ile
207                  165                 170                 175
208  Asp Val Leu Thr Arg Ala Asp Gly Val Lys Tyr Ala Asp Leu Val Leu
209              180                 185                 190
210  Met Arg Glu Leu Asp Arg Glu Ile Gln Pro Thr Tyr Ile Met Glu Leu
```

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Input Set : A:\510015-261.TXT
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```
211          195                 200                 205
212  Leu Ala Met Asp Gly Gly Val Pro Ser Leu Ser Gly Thr Ala Val Val
213      210                 215                 220
214  Asn Ile Arg Val Leu Asp Phe Asn Asp Asn Ser Pro Val Phe Glu Arg
215  225                 230                 235                 240
216  Ser Thr Ile Ala Val Asp Leu Val Glu Asp Ala Pro Leu Gly Tyr Leu
217                  245                 250                 255
218  Leu Leu Glu Leu His Ala Thr Asp Asp Asp Glu Gly Val Asn Gly Glu
219              260                 265                 270
220  Ile Val Tyr Gly Phe Ser Thr Leu Ala Ser Gln Glu Val Arg Gln Leu
221          275                 280                 285
222  Phe Lys Ile Asn Ser Arg Thr Gly Ser Val Thr Leu Glu Gly Gln Val
223      290                 295                 300
224  Asp Phe Glu Thr Lys Gln Thr Tyr Glu Phe Glu Val Gln Ala Gln Asp
225  305                 310                 315                 320
226  Leu Gly Pro Asn Pro Leu Thr Ala Thr Cys Lys Val Thr Val His Ile
227                  325                 330                 335
228  Leu Asp Val Asn Asp Asn Thr Pro Ala Ile Thr Ile Thr Pro Leu Thr
229              340                 345                 350
230  Thr Val Asn Ala Gly Val Ala Tyr Ile Pro Glu Thr Ala Thr Lys Glu
231          355                 360                 365
232  Asn Phe Ile Ala Leu Ile Ser Thr Thr Asp Arg Ala Ser Gly Ser Asn
233      370                 375                 380
234  Gly Gln Val Arg Cys Thr Leu Tyr Gly His Glu His Phe Lys Leu Gln
235  385                 390                 395                 400
236  Gln Ala Tyr Glu Asp Ser Tyr Met Ile Val Thr Thr Ser Thr Leu Asp
237                  405                 410                 415
238  Arg Glu Asn Ile Ala Ala Tyr Ser Leu Thr Val Val Ala Glu Asp Leu
239              420                 425                 430
240  Gly Phe Pro Ser Leu Lys Thr Lys Lys Tyr Tyr Thr Val Lys Val Ser
241          435                 440                 445
242  Asp Glu Asn Asp Asn Ala Pro Val Phe Ser Lys Pro Gln Tyr Glu Ala
243      450                 455                 460
244  Ser Ile Leu Glu Asn Asn Ala Pro Gly Ser Tyr Ile Thr Thr Val Ile
245  465                 470                 475                 480
246  Ala Arg Asp Ser Asp Ser Asp Gln Asn Gly Lys Val Asn Tyr Arg Leu
247                  485                 490                 495
248  Val Asp Ala Lys Val Met Gly Gln Ser Leu Thr Thr Phe Val Ser Leu
249              500                 505                 510
250  Asp Ala Asp Ser Gly Val Leu Arg Ala Val Arg Ser Leu Asp Tyr Glu
251          515                 520                 525
252  Lys Leu Lys Gln Leu Asp Phe Glu Ile Glu Ala Ala Asp Asn Gly Ile
253      530                 535                 540
254  Pro Gln Leu Ser Thr Arg Val Gln Leu Asn Leu Arg Ile Val Asp Gln
255  545                 550                 555                 560
256  Asn Asp Asn Cys Pro Val Ile Thr Asn Pro Leu Leu Asn Asn Gly Ser
257                  565                 570                 575
258  Gly Glu Val Leu Leu Pro Ile Ser Ala Pro Gln Asn Tyr Leu Val Phe
259              580                 585                 590
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VERIFICATION SUMMARY
PATENT APPLICATION: US/09/903,323A

DATE: 03/18/2002
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Input Set : A:\510015-261.TXT
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